CHEMICALS

Project Fact Sheet

Mesoporous Membranes For Olefin Separations

Benefits

- 40% reduction in energy consumption
- 24% decrease in CO_2 emissions
- Reduced manufacturing costs
- Cost-effective capacity increases up to 50%

Applications

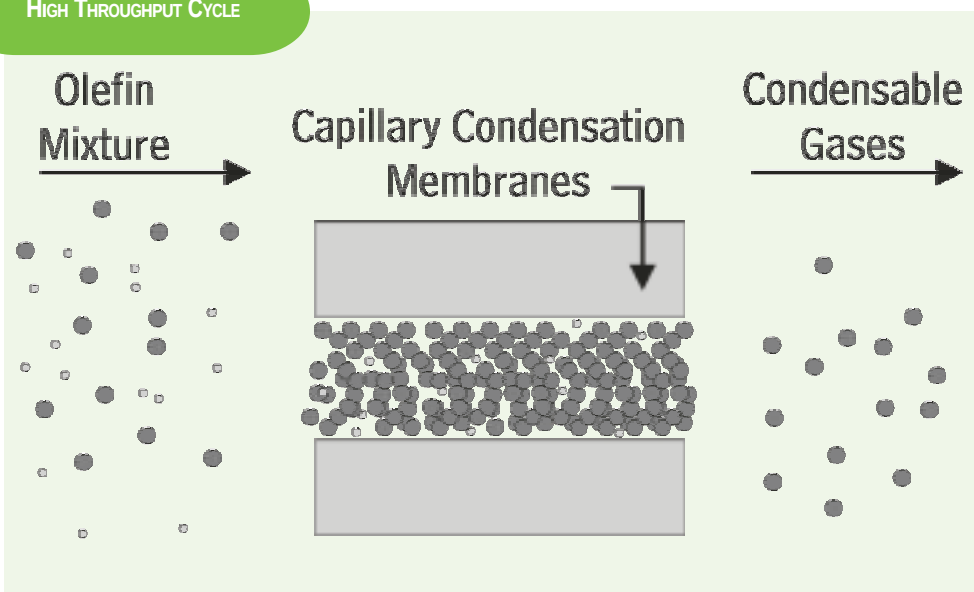
In the U.S., there are about 30 olefins complexes. 75% of these plants utilize technology that is over twenty years old and need upgrading. Implementation of this membrane technology is possible at virtually all of these plants.

Multistaged Membrane Modules Could Replace Distillation Processes in Olefin Plants

Olefins, such as ethylene and propylene, are the building blocks for a wide variety of chemicals and plastics. They are currently separated by cryogenic distillation, an energy-intensive process due to the extremely low temperatures and high pressures required. Over 75 billion pounds of ethylene and propylene are distilled annually in the U.S. at an estimated energy requirement of 400 trillion BTUs.

An innovative mesoporous membrane separation process promises to yield significant energy and cost savings for the U.S. olefins industry. The non-cryogenic process using membranes with selective permeabilities to separate olefinic mixtures from light gas byproducts will substantially reduce energy and capital costs. This revolutionary technology will utilize higher temperatures and lower pressures than are currently necessary in the demethanizer feed chilling system. Additionally, this technology will eliminate the reboiling energy requirements for up to four distillation towers. The commercialization of this technology could reduce the energy consumption of U.S. olefins plants by 40 trillion BTUs per year by 2020.

High Throughput Cycle



High-throughput techniques enable rapid analysis of additive combinations and accelerate product development.

Project Description

Goal: To demonstrate the economic, technical and commercial potential of a novel membrane separation process for olefin plants. If successful, the end-result of the project will be the design of a commercially-scaleable pilot plant that is using uniquely-optimized, mesoporous membrane systems to separate olefinic mixtures from light gas by-products.

Progress & Milestones

Project partners have obtained a patent for developing a new method for fabricating thin porous films suitable for a condensation separation mechanism. These materials have been tested and demonstrated in the separation of hydrogen from hydrocarbon mixtures and the separation of C1, C2, and C3 hydrocarbons by the condensation approach. Furthermore, some preliminary measurements have been performed on hollow fiber modules to replace alumina as a substrate.

Future research will focus on:

- Determining separation factors for C1 through C4 hydrocarbons in the presence of hydrogen using hollow fiber membrane modules.
- Developing a mathematical model of a multistage membrane module system for use in predicting and optimizing module performance.
- Developing the multistage membrane module and characterize performance.
- Optimizing the multistage module using a combination of experimental and modeling techniques.

Commercialization

BP Amoco is experienced in the critical evaluation and implementation of innovative separation processes. The end-result of this project will be the design of a commercially-scaleable pilot plant. The technology will be licensed for application industry-wide.

Project Partners

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